introduces a new term—the synapse, or the surface contact space, between the neurones. There is a point where resistance is met with, and which takes time to overcome. This "synaptic phase" he has carefully measured. Special consideration is given to the study of variable stimuli in regard to conductivity.

Inhibition is regarded by Sherrington not as an independent phenomenon, but as a part of the function of excitation, and an essential part. Reciprocal innervation brings about suppression, and an internuncial mechanism is posited as necessary for the production of the inhibitory process.

Sherrington then takes up the problem of the compounding and interactions of reflexes and follows by an analysis of the physiological position of and reasons for the dominance of the brain.

The interesting position, which will probably lead to much discussion, is taken that a physiological basis for psychical fusion is not present, nor is it required.

The work is one of great significance, and though difficult to follow for the student who has not been saturated with the modern experimental physiology of nerve trunks and fiber tracts, its reading will prove stimulating.

Jelliffe.

Gehirn und Seele. Vorlesungen von Prof. Dr. med. Paul Schultz; Herausgegeben von Dr. Hermann Beyer. Johann Ambrosius Barth, Leipsig.

This is a series of semi-popular lectures on philosophical subjects given by Prof. Schultz during the years 1899 to 1904 in the University of Berlin. They differ from most lectures of the kind in the wideness of their scope, general philosophical considerations being paramount in the earlier pages, while later the author discusses at length the question of the reflexes, the activities of earth worms, heredity, psychical functions of ants and bees, embryology of the human brain, critique of Gall's phrenology, Broca's speech centers, Hitzig-Flechsig's theory of association centers, hallucinations, sleep, hypnosis, etc.

There is no attempt at completeness in the present presentation. It is a readable philosophical treatise, couched in popular language. Jelliffe.

Gesammelte Hirnanatomische Abhandlungen; mit einem Aufsatz ueber die Aufgaben der Neurobiologie. Von Dr. August Forel, ehemals Professor der Psychiatrie und Direktor der Irrenanstalt in Zürich, in Yvorne (Schweiz). Illustrated with 12 plates (engravings). Ernst Reinhardt, München, 1907.

To find Forel's contributions to brain anatomy all published in one volume, will give great pleasure to his many admirers, and will give to those less familiar with his work opportunity of appreciating his merit as one of the pioneers of present-day brain anatomy.

The undersigned, who was so fortunate to be one of the author's assistants when he was Director of the Insane Hospital, Burghoelzli, and Professor of the Psychiatric Clinic of Zurich, deems it a particular favor to have the opportunity of reviewing his work in brain anatomy as embodied in the volume before us.

Those who have worked under Forel cannot but have been deeply impressed by his powerful personality and intellect, and have carried away with them rich experience serving as intellectual food for many years to come. Under the stimulating influence of his vivacious conversation, always interesting and many-sided, but often deeply philosophical, the minds of those who listened to him could not help being broadened. To hear him discuss one day Haeckel's biogenetic law and another time Kant and Herbert Spencer, or listen to a discourse on color blindness, or to his views regarding the interpretation of the marvellous sense of locality in birds, or again to hear him make a harangue of the French school with humoristic allusions to the grand diseases issuing from Paris, such as the grand mal, grand hysterie, grand hypnotisme, etc., was full of inspiration and of lasting benefit to the listener.

To the reviewer's knowledge Forel's studies in brain anatomy were in the main initiated under Meynert, and the second* paper of the collection before us was worked out under Meynert, and to some extent bears the stamp of his influence. So, for instance, he made use in it of Meynert's "Abfaserungsmethode," which consists in following fiber tracts by picking off the adjoining matter by means of a forceps and thus isolating the tracts.

But even in this paper he was already aware of some of the defects of Meynert's methods in reaching results and conclusions, and kept himself to a considerable degree free from them. He later gave expression to this stand (in his monograph on the tegmental region) in the following words: "Finally I wish to state that when five years ago, under the guidance of Professor Meynert, I published the work just mentioned, I was still entangled in many prejudices and in particular considered most of the statements of Meynert as well established, which explains many divergences from my present results. The circumstance as well as the fact that it was my first attempt in brain anatomy, and that I worked with a less complete material, may serve as an excuse. That on many points I already then had my doubts, every careful reader will perceive."

The paper referred to bears the title, "Beiträge zur Kenntnis des Thalamus opticus und der ihn umgebenden Gebilde bei den Säugetieren." It constitutes a very valuable objective, comparative-anatomical contribution to the knowledge of the optic thalamus and the structures surrounding it. Of the points brought out in it, be it briefly mentioned, that the importance is shown of the development of the pulvinar in defining the location of the geniculate bodies, which in man with a well developed pulvinar are crowded outward, but move upward and inward—particularly the external geniculate body—the lower one descends in the scale of mammalians. To enter on other details of this work the space allotted for this review does not allow, except to mention that Forel's contentions are accompanied by numerous measurements of the structures in question.

The contribution next in order, entitled "Untersuchungen über die Haubenregion und ihre oberen Verknüpfungen im Gehirne des Menschen und einiger Säugertiere; mit Beiträgen zu den Methodon der Gehirnuntersuchung," was issued from Professor Gudden's laboratory. In this monograph F. has altogether emancipated himself from Meynert's influence, and put forth his guiding principle in the following words: "My leading thought in the following lines as well as in the figures was always the strict avoidance of all diagrams and of going beyond well established facts, since I consider these two faults to be the most assailable points of brain anatomy. May I have been successful." That he indeed was

*The first paper will be discussed at the end of this review.

successful in carrying his point certainly must impress itself on the careful reader of these investigations.

His appreciation of Meynert's merits is expressed in the following words, taken from the same monograph: "The only author who on the basis of histological researches of the present has dared to attempt to clear up the mysterious obscurity of the cerebrum and basal ganglia, is Meynert. This was an extremely meritorious and stimulating attempt." On the other hand, F.'s perception of Meynert's failings, while aware of his greatness, is embodied in the following statement: "It must soon become clear that notwithstanding his perspicacity, his foresight, which unquestionably bore the stamp of genius, and in spite of his great knowledge of the brain, the certain and uncertain hypothesis and fact are in his statements interwoven with each other in a manner to often make their separation or distinction impossible."

The above mentioned investigations begin with a subject of historical interest, one mght truly say; *i. e.*, a careful detailed description of the Gudden microtome, the instrument by means of which so much splendid work has been done in brain anatomy, by Gudden's school, v. Monakow, Dejerine and many others. That instrument had then only recently been invented by Professor Gudden, and its minute description by Forel, with pointing out of all its advantages and disadvantages and the avoidance of the latter, came àpropos.

This is followed by a description of the hardening and coloring technique used by him; with a critical discussion of the methods then in use. Next the methods of examination of the brain in general and their delimitations are considered, which again forms an historically interesting chapter. The "Abfaserungsmethode" of Meynert which has already been mentioned, is here strongly condemned, owing to its absolute unreliability.

Then comes the actual anatomical research which fully deserves to be designated as a classical treatment of the subject. It gives a masterly description of the structures forming the subject of study, in which, true to the principle laid down by him in the introduction, facts are strictly kept apart from probabilities, and these again from conjectures, giving each of them their true value. So important are these investigations for the knowledge, even purely topographically, of the regions described, that one can hardly take up a proper study of these regions without reference to Forel's work. This has particular reference to the subthalamic region of which Forel gives a complete map; and, as already pointed out, his statements are made with such objectivity, free from speculation, that even as our knowledge of the anatomical connection and physiological function of the different structures encompassed in these regions advances, yet the land-marks laid down by him will continue their value as topographical guides for years and years. This value is greatly enhanced by the numerous fine drawings accompanying the monograph, and made by the investigator's own skilful hand.

The investigations on the tegmental region are followed by some smaller communications and discussions, in which Forel points out the clearness of the results obtained with Gudden's method, as compared with the purely anatomical method. Gudden's method "consists in removing from the new-born animal (rabbit, dog) certain parts of the central or peripheral nervous system. The animal is then allowed to grow up and one studies both the loss of functions and the secondary inactivity-atrophy which the structures functionally dependent of the extirpated part undergo."

He summarizes the results obtained by Gudden and his pupils, Mayser, Ganser and Forel himself, as applied to motor nerves, sensory nerves, nerves of special sense, cortical motor centres and other structures.

A brief report of some extremely interesting findings in general paresis and senile dementia then follows, which shows the author's diagnostic powers. In one case a hemiplegia was clinically diagnosed and confirmed post-mortem to be not focal, but the outcome of the diffuse anatomical process underlying general paresis, predominating in one hemisphere. In the second case of paresis, the almost complete lack of physical signs with marked involvement of the psyche led to the diagnosis of a paresis with affection mainly of the frontal lobes, leaving the motor centres almost intact; and the autopsy fully bore out that diagnosis. In the third case, which was a senile dementia, an atrophy particularly of the temporal lobe was found as the substratum of word-deafness.

Three preliminary communications on the origin of the auditory nerve, one of them in conjunction with the undersigned, then follow. The interesting results embodied therein were obtained by Forel by means of Gudden's method, which in this special application required a particular skill.

The contribution next in order, entitled "Einige hirnanatomische Betrachtungen und Ergebnisse," reveals some extremely important facts. We note therein not only the author's early appreciation of the value of Golgi's work, as achieved with the method of metallic impregnation, but also the utilization of Golgi's results and of the results obtained with Gudden's method, for building up the neurone theory. That this theory indeed is distinctly formulated here already, built up on a substantial basis, must become clear to every careful reader. Of great interest is the fact that while His, in an article appearing four months earlier than that of Forel, had come to a view identical with that of Forel and, therefore, could justly claim priority for the formulation of the neurone doctrine, nevertheless, Forel could prove that the manuscript of his article was already in the hands of the publishers at the time when his paper appeared in print; so that there could be no question that both had independently reached the same result. (See page 210.)

Another important issue in this paper is the thorough study of the laws underlying the results of Gudden's method, this study being based on experiments on new-born and adult animals, with variation of the points of attack in the nerves experimented on.

The paper is full of other important deductions and suggestions which lack of space forbids to discuss here.

Then follow two communications, one relating to the origin and connections of the auditory nerve (Zur Acusticusfrage), the other on the connections of the elements of the nervous system.

In two further short communications the results of counts of nerve fibers in the oculo-motor nerve of the new-born and adult cat respectively are given. The work was done by M. H. Schiller but inspired by Forel, and reveals that the number of fibers of said nerve is virtually the same in the adult as in the new-born. This observation, if confirmed in other instances would allow important conclusions as to the manner of growth of the nervous structures, indicating growth in size rather than by increase in the number of elements.

The paper succeeding these two communications and entitled "Ueber das Verhältniss der experimentellen Atrophie und Degenerations methode zur Anatomie und Histologie des Centralnervensystems," deals again to a great extent with the method of Gudden and its merits. Here the writer shows how early he appreciated the general principle underlying the method of Gudden. As early as 1868 the latter author, having torn out the facial nerve from the Fallopian canal in new-born rabbits had thus, contrary to former observations, produced an atrophy of the facial nucleus, "which he, in his lectures in Zürich demonstrated to us (*i. e.,* to Forel and other students), macroscopically as a depression of the basis of the oblongata in the region of the nucleus on the side of operation." Later this atrophy was verified microscopically by Dr. Mayser, who cut the brain in serial sections. "Strangely enough," Forel goes on to say, "von Gudden remained in the belief that this was a peculiarity of certain nerves only, while I repeatedly expressed to him my conviction that it must be a general law for all motor nerves; that their central cells of origin perish, when in the new-born they are separated from the basis of the brain (or spinal cord respectively)."

Another point deserving quotation here is the broad view he takes as to the methods which should be pursued in studying the morphology and functions of the central nervous system: "After the experience of many years, and basing on my own investigations in the domain of the morphology and of the functions of the central nervous system, I wish to put up the following dictum: That all methods of investigation must be employed hand in hand and compared with each other in their results; that each brain anatomist and physiologist should know and duly appreciate them, and that in involved conditions as a rule only those results and theorems should go as established anatomical truths, which have successfully stood the test and confirmation by all methods." He then enumerates these methods as follows: First, gross structural anatomy. Second, study of continuous series of sections. Third, final histology of the elements. Fourth, comparative anatomy and histology of the central nervous system. Fifth, embryology. Sixth, the experimental method of secondary atrophies and degenerations. Seventh, the study of abnormalities of the central nervous system (especially agenesies of the same), and of pathological cases in general. Eighth, the method of studying fiber systems by means of the development of the medullary sheaths at different periods of time. Ninth, the physiological experiment itself.

In this paper Forel also explains the reasons why the work of Gudden and his school has not received the appreciation and notice which it deserves, giving, at the same time, the result of researches of Mayser and Ganser on the origin of the tenth, eleventh and twelfth nerves, and of the connections of the optic nerve respectively.

The contribution following, published in conjunction with Wl. Onufrowicz, deals with the defects of the corpus callosum and is accompanied by numerous illustrations made by Forel hmself. This work, because of its interesting conclusions, has given rise to considerable discussion.

The book winds up with a brief communication regarding the nuclei of the glossopharyngeal and trigeminal nerves and two discussions on the neurone doctrine. In the latter one of these, Apathy's and Bethe's work are critically reviewed and a reconciliation of their results with the neurone theory attempted.

The reviewer has left to the end the paper entitled "The Problems of Neuro-biology," which appears as the first one in the book. This was done for the reason that it is the latest one chronologically. It gives a critical review of our present knowledge of neuro-biology and indicates the lines along which further knowledge should be gained. From a man who has enriched this field as much as he by original research and critical discussion of the work of others, such a review must be welcomed as very valuable and suggestive. Very modestly he expresses himself on this point in the introduction of the book, as follows: "I have nevertheless always followed the further development of brain morphology with interest and endeavored to further its connection with the other branches of brain science and with neuro-biology in general. May I, therefore, not be accused of presumption if I precede these old contributions by a brief study on "The problems of neuro-biology."

The publisher, M. Reinhardt, Muenchen, is to be congratulated and commended for the manner in which the book is gotten up, and particularly for the fine reproduction of the numerous illustrations, for which the original drawings were almost all made by Forel himself.

B. ONUF (Onufrowicz).

ORGANIC AND FUNCTIONAL NERVOUS DISEASES. By M. Allen Starr. Second Edition. pp. 816. Lea Brothers & Co., New York and Philadelphia. 1907.

This is the second and revised edition of Dr. Starr's book and contains in addition a section devoted to functional nervous diseases. It has been so well received that it has been found necessary to put forth a second edition within a year, and it is so far the most complete book on nervous diseases attempted by a single American author containing a treatise on all organic and functional nervous diseases. Its distinguishing feature is that it is a presentation of the personal experience of over twenty-five years of neurological practice.

Not much space is given to the anatomy of the nervous system, and the author does not enter into discussion of the various neurone theories. Eight chapters, this including 122 pages, are devoted to a consideration of the nerves and their diseases, their injuries, neuralgia and multiple neuritis. Without question this discussion is about as complete and well written as is to be found in any book upon nervous diseases. Dr. Starr's experience in the treatment of neuralgia of the fifth nerve is interesting. He states that aconitine is the best remedy, and he gives it in pill form in doses of 1-500 of a grain until constitutional effects are obtained. In the discussion of the symptoms of sciatica he fails to mention the usual absence of the Achilles jerk, and in speaking of the symptoms produced by carbon bisulphite poisoning the author states that he has not found any published cases in this country, evidently not being acquainted with the cases published by Jump and Cruice, and he also does not mention the hysterical symptoms so common in this disease. He justly says that multiple neuritis is probably not caused by syphilis.

The diagnosis and localization of spinal cord diseases is next taken up and well discussed, and the original diagrams used to illustrate the course of the motor and the various sensory tracts, are excellent and so far the best that have appeared in any book. He rightly speaks of chronic anterior poliomyelitis and progressive muscular atrophy as identical diseases, although in the discussion of the symptoms he mentions three types: That